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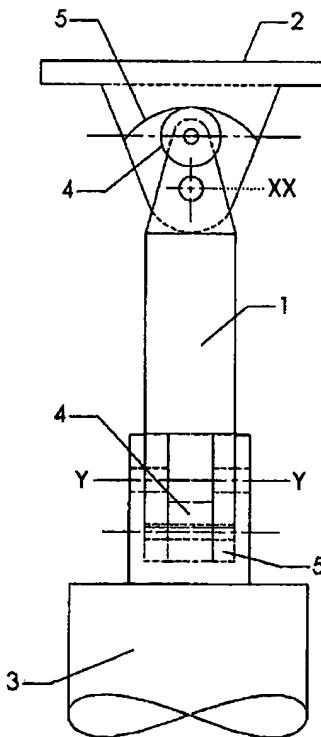
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(54) Title: DAMPENING APPARATUS



(57) Abstract: A support structure for a tool (3) such as a post hole borer is provided with means (4, 5) for dampening pendulous movements with respect to a support (2). Dampening may be affected using frictional, compressible or contact devices or a combination of thereof.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## DAMPENING APPARATUS

### TECHNICAL FIELD

This invention relates to dampening apparatus and has  
5 particular relevance to apparatus used for dampening or otherwise controlling  
the movements of elements of equipment and machinery.

### BACKGROUND ART

Agricultural and construction equipment and machinery is often  
10 used in situations where the personal safety of operators and others within  
the vicinity of the machinery is of primary importance.

Many types of machinery such as that used for drilling, digging,  
cutting and the like a tool is suspended from a boom arm or other form of  
support.

15 Rotatable auger devices or examples are generally suspended  
from booms and engineered so that the auger can be set up to drill vertical  
holes in required positions despite the fact that the surrounding terrain may  
mean that the vehicle to which the device is attached is not on a level surface.

To accommodate various types of terrains and conditions the  
20 augers are normally suspended so that they are able to freely swing on  
intersecting planes.

When drilling is not taking place and the vehicle or boom arm is  
being moved, the augers can pendulate in a largely uncontrolled manner  
creating a particularly dangerous potential impact situation for the operator  
25 and persons or property nearby.

Drilling augers are not the only types of equipment where tools  
are able to pendulate in a dangerous manner, other examples being pile  
drivers, mowing, lifting, cutting and digging equipment.

It is an object of the present invention to provide a support  
30 structure for a tool where pendulation of the tool with respect to a supporting  
device is controlled and/or inhibited.

Further objects and advantages of the present invention will  
become apparatus from the ensuing description which is given by way of

example.

#### DISCLOSURE OF INVENTION

According to the present invention, there is provided a support

5 structure for a tool comprising

(a) a boom or arm for supporting the tool,

(b) a pendulous pivot for supporting the tool with respect to  
the boom or arm in a manner which allows the tool to pendulate,

(c) dampening means for controlling the pendulation of the

10 tool on the pivot with respect to the boom or arm characterised in that the  
dampening is controlled by frictional, compressible or contact devices or a  
combination of such devices.

The frictional, compressible or contact devices can be used  
alone or in combination and may include the use of wheels, opposed  
15 compressible devices, friction tyres, bearings and the like.

The support structure can include a boom, a first pivoted link  
supporting the tool from the boom and enabling it to swing in a first plane and  
a second pivoted link on a second plane at right angles to the first plane, and  
dampening means for controlling the pivoting of the tool relative to the boom  
20 in either plane.

The dampening on a first plane can be provided by a wheel in  
contact with an asymmetric rail and on a second plane by a wheel in contact  
with a further asymmetrical rail.

Dampening can be provided by buffer devices which have  
25 convoluted shapes arranged in such a manner that when the device is  
pressed another associated device is stretched.

The pivoted links may include frictional bearings.

The wheels can have compressible outer sleeves in contact with  
the rails.

30

#### BRIEF DESCRIPTION OF THE DRAWINGS

Aspects of the present invention will now be described with  
reference to the accompanying drawings in which:

Figures 1 and 2 are side views of a dampening apparatus according to one aspect of the present invention, and

Figures 3 and 4 are side views of a dampening apparatus according to another aspect of the present invention.

5       The dampening apparatus illustrated by figures 1 to 4 are alternatives to that described in our International Patent Application no. PCT/AU02/00295 and the positioning and functioning of all apparatus is similar.

Accordingly, the description in the International Application  
10 should be read in conjunction with the description of the further embodiments herewith.

With respect to figures 1 and 2 of the drawings, a yoke 1 is pivoted between a support 2 and an object such as a motor gearbox, tool, or implement the like 3.

15      The pivot axis XX:YY intersect at right angles.

In the example illustrated, the pivoting on axis XX:YY is damped by wheels 4 in contact with rails 5 attached to the support 2 and an object.

The wheels 3 may be semi-resilient.

20      As the object 3 pivots on axis X:X the wheels track on the internal surfaces of the rails 5 and because the rails are not symmetrical, the pivoting is restrained.

Further restraint or dampening may be achieved by the use of resilient wheel treads or rubbers.

25      In a further embodiment of the present invention described by figures 3 and 4 of the drawings, dampening on one plane can be achieved by the use of associated buffers 6 and shock absorbing means 7.

The set up of the yoke 1 is similar to that described in relation to the figures 1 and 2 embodiments.

30      The buffers 6 may comprise two separate rings of a substantially convoluted configuration each of the rings having mounting apertures 8.

The yokes pivoting axes XX:YY are shown in figures 3 and 4.

Pivot pins 9 secure the buffers 6 in a triangular arrangement

with each buffer being secured at one side and together towards the base of the buffers via a lug 10 which extends from the yoke 1.

The buffers are overlapped.

When an object 1 pivots on axis X:X, the lug 10 will pivot to one  
5 side in concert with the pivoting movement.

The buffers 6 are fabricated or moulded in a "memory" material e.g. polyurethane, one buffer will compress and the other will stretch in sympathy with the movement and dampening of the pivoting movement will occur.

10 Pivoting of the object 3 on axis of Y:Y brings the shock absorbing means 7 into play.

The shock absorbing means 7 are fixed to a plate 11 and may be in the form of resilient pads, springs or pistons.

15 Major elements of the dampening system can be standardised so that retro-fitting and changes to the actual dampening devices used can be effected in a short time to suit projected uses and for maintenance purposes.

It should be appreciated that the present invention provides a dampening apparatus which is adjustable to control the movements of many different forms of suspended tool whilst they are in an active or inactive state.

20 Apart from the obvious safety advantages of the present invention and its predecessor as described in International Patent Application No. PCT/AU02/00295 the elements of the invention can be interchanged for different applications and uses and readily maintained.

25 The invention will provide an inexpensive safety facility for a large range of suspended objects where pendulation is a danger to property and people.

Aspects of the present invention have been described by way of example only and it will be appreciated that modifications and additions thereto may be made without departing from the scope thereof, as defined in  
30 the appended claims.

## CLAIMS:

1. A support structure for a tool comprising
  - (a) a boom or arm for supporting the tool,
  - (b) a pendulous pivot for supporting the tool with respect to  
5 the boom or arm in a manner which allows the tool to pendulate,
    - (c) dampening means for controlling the pendulation of the tool on the pivot with respect to the boom or arm characterised in that the dampening is controlled by frictional, compressible or contact devices or a combination of such devices.
- 10 2. A structure as claimed in claim 1 said support structure including a boom, a first pivoted link supporting the tool from the boom and enabling it to swing in a first plane and a second pivoted link on a second plane at right angles to the first plane, and dampening means for controlling the pivoting of the tool relative to the boom in either plane.
- 15 3. A structure as claimed in claim 2 wherein dampening on a first plane is provided by a wheel in contact with an asymmetric rail and on a second plane by a wheel in contact with a further asymmetrical rail.
4. A structure as claimed in claim 2 wherein dampening is provided by buffer devices which have convoluted shapes arranged in such a manner  
20 20 that when the device is pressed another associated device is stretched.
5. A structure as claimed in claim 2 wherein the pivoted links include frictional bearings.
6. A structure as claimed in claim 3 wherein the wheels have compressible outer sleeves in contact with the rails.
- 25 7. A support structure substantially as herein described with reference to the accompanying drawings.

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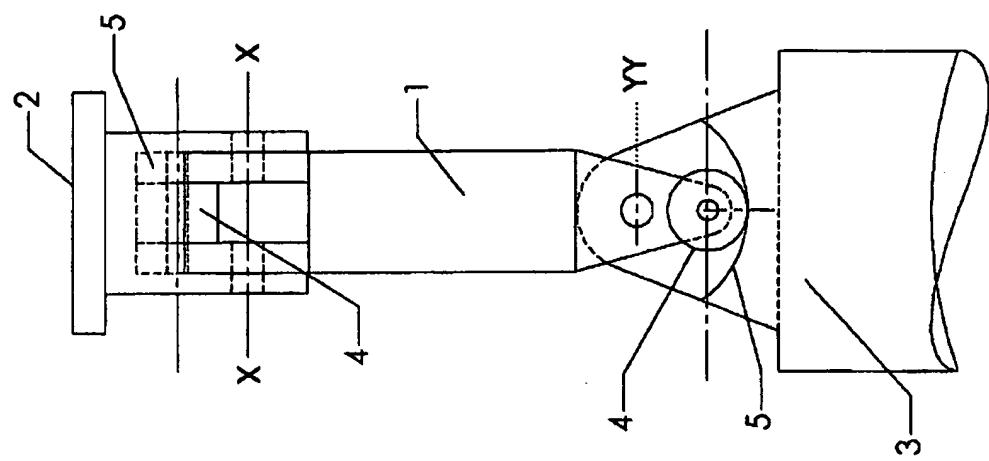


FIG-2-

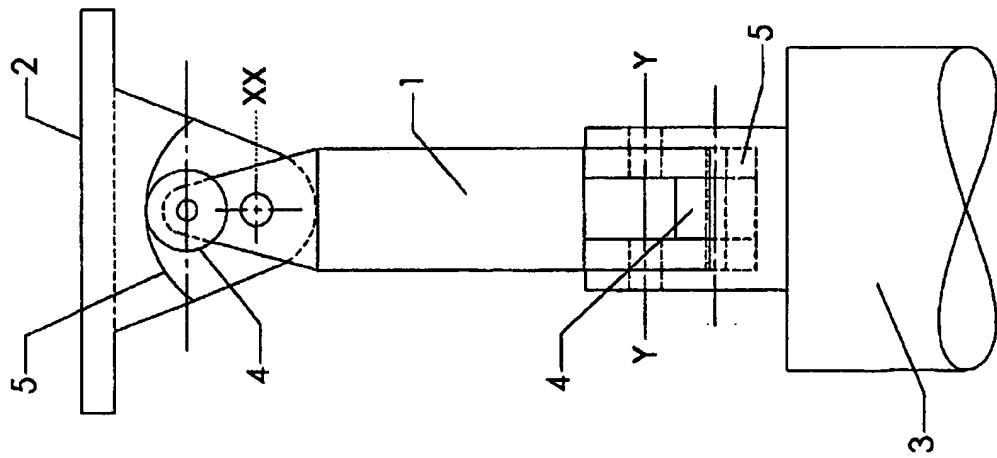
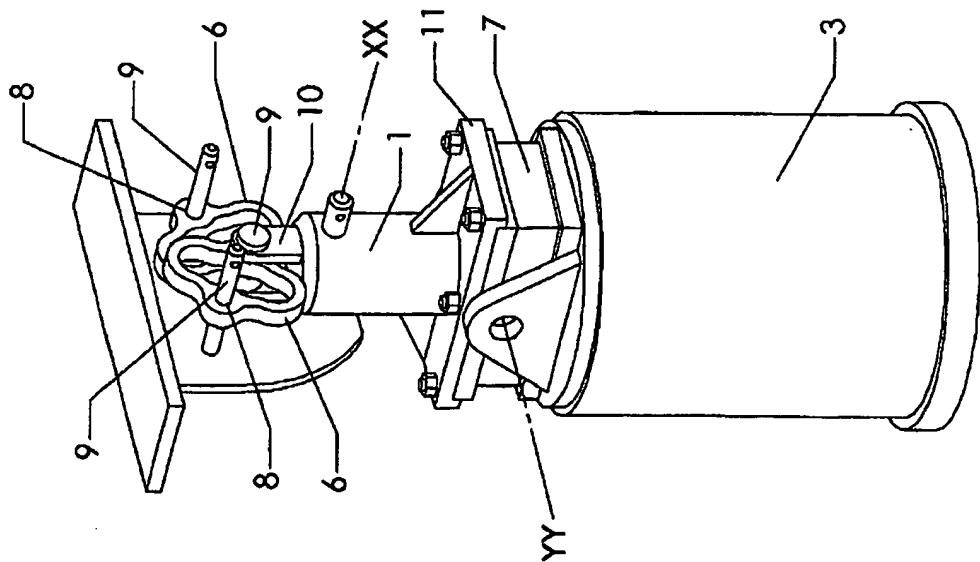
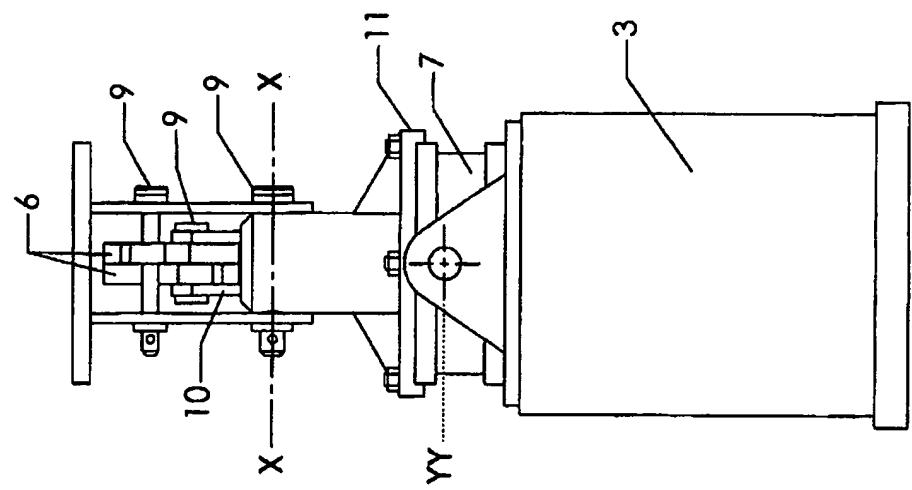


FIG-1-

2/2



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00557

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl. ?: E02F 5/16, 5/20, 9/24; F16F 11/00, 15/00, 15/023, 15/027; A01B 61/04		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: DC: P11, Q63, Q42, Q49 with keywords (pendulous, damp, support)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	WO 02/072964 A1 (WRIGHT) 19 September 2002 Whole document	1-7
X	WO 00/53522 A1 (INDEXATOR AB) 14 September 2000 Whole document	1-6
X	US 5507354 A (HARLEMAN) 16 April 1996 Whole document	1-6
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C		<input checked="" type="checkbox"/> See patent family annex
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 1 July 2003	Date of mailing of the international search report 03 JUL 2003	
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## INTERNATIONAL SEARCH REPORT

International application No.  
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4735158 A (PAUL ET AL.) 5 April 1988 Whole document	1-6
X	US 4342270 A (LOFGREN ET AL.) 3 August 1982 Whole document	1-6
X	US 4273056 A (LOFGREN ET AL.) 16 June 1981 Whole document	1-6
X	FR 2314435 A (A.R.M.E.F.) 7 January 1977 Whole document	1-6

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/AU03/00557**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	2002072964	AU	20013715				
WO	200053522	AU	200036893	CA	2366291	EP	1175368
		SE	9900836				
US	5507354	NONE					
US	4735158	CA	1250185				
US	4342270	CA	1151953	FI	810488	SE	8004686
US	4273056	CA	1108016	DE	2919962	FI	791544
		SE	7805797				
FR	2314435	NONE					
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